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PESTS NOT KNOWN TO OCCUR IN THE UNITED STATES OR OF LIMITED DISTRIBUTION, NO. 62: SUMMER FRUIT TORTRIX MOTH

Prepared by K. Whittle, Biological Assessment Support Staff, PPQ, APHIS, USDA, Federal Building Room 634, Hyattsville, MD 20782

Pest

SUMMER FRUIT TORTRIX MOTH
Adoxophyes orana (Fischer von Roeslerstamm)

Selected Synonyms

Adoxophyes reticulana (Huebner)

Order: Family

Lepidoptera: Tortricidae

Economic Importance

Summer fruit tortrix moth is a major pest of apples and pears in most parts of Europe, Asia, and the Soviet Union. In Ukraine, Soviet Union, this species frequently damages 10-30 percent of the leaves and flowers of apples (Savkovskii and Lyalyutskaya 1967). Up to 10 and 20 percent fruit loss has occurred in France and Germany, respectively (U.S. Department of Agriculture 1984). In the Netherlands, annual damage to apples averages 4 percent. Loss there in 33,000 ha of apples totaled $1.2 million plus $0.3 million for insecticides in 1967 (de Jong et al. 1971).

Hosts

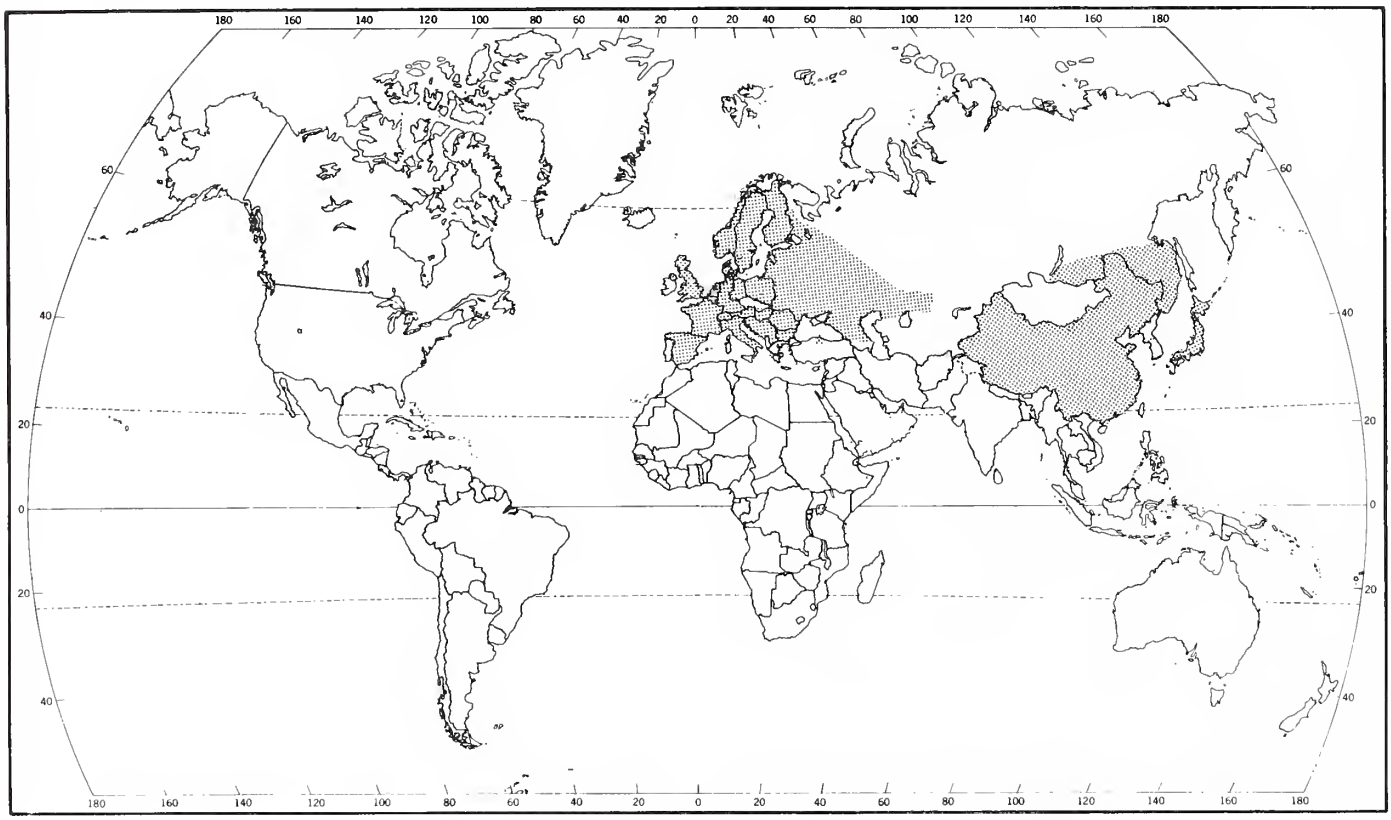
Larvae feed on many Rosaceae such as *Cotoneaster dielsianus*, *Crataegus* sp., *Cydonia oblonga* (quince), *Fragaria* sp. (strawberry), *Malus baccata* (Siberian crabapple), *M. sylvestris* (apple), *Prunus armeniaca* (apricot), *P. avium* (sweet cherry), *P. cerasus* (sour cherry), *P. domestica* (garden plum), *P. insititia*, *P. padus*, *P. persica* (peach), *P. triloba*, *Pyrus communis* (pear), *Rosa canina* (dog rose), *Rubus fruticosus* (European blackberry), and *R. idaeus* (red raspberry).

They also feed on several members of other plant families including *Acer campestre* (maple), *Alnus* sp. (alder), *Betula* sp. (birch), *Carpinus betulus* (European hornbeam), *Corylus* sp. (filbert), *Fagus sylvatica* (European beech), *Forsythia suspensa*, *Fraxinus* sp. (ash), *Gossypium herbaceum*, *Humulus* sp. (hops), *Laburnum*, *Ligustrum* sp. (privet), *Lonicera caprifolium*, *L. xylosteum*, *Medicago* sp., *Menyanthes trifoliata*, *Parrotia* sp., *Physalis peruviana* (Cape-gooseberry), *Pistacia lentiscus* (mastic), *Populus* sp. (poplar), *Quercus* sp., *Ribes nigrum* (black currant), *R. rubrum* (red and white currants), *R. uva-crispa* (European gooseberry), *Salix caprea* (goat willow), *S. viminalis* (basket willow), *Solanum dulcamara* (bitter nightshade), *Symphoricarpos albus*, *Tilia* sp. (linden), *Ulmus* sp. (elm), *Urtica* sp. (nettle), and *Vaccinium* sp. (Balachowsky 1966, Bradley et al. 1973, de Jong et al. 1971, Swatschek 1958).

In the Netherlands and Belgium, this species is a pest on Syringa vulgaris (lilac). It also attacks Gossypium hirsutum (cotton) in the Soviet Union and Camellia sinensis (tea) in Japan (de Jong et al. 1971).

General Distribution

A. orana occurs in ASIA: China and Japan; in EUROPE: Austria, Belgium, Bulgaria, Denmark, East Germany, Finland, France, Hungary, Italy, Netherlands, Norway, Poland, Romania, Spain, Sweden, Switzerland, United Kingdom, West Germany, and Yugoslavia; and in the SOVIET UNION: Amur (south-east), Northern Caucasus, Siberia, Soviet Far East, Transcaucasia, Ukraine, and Ussuri (south) (Commonwealth Institute of Entomology 1982).



Adoxophyes orana distribution map prepared by Non-Regional Administrative Operations Office and Biological Assessment Support Staff, PPQ, APHIS, USDA

Characters

ADULTS - Male (Fig. 1). Wingspan 15-19 mm forewing with broad costal fold from base to about one-third (Bradley et al. 1973). Head as shown in Fig. 3 (Obraztsov 1954), antenna shortly ciliate. Forewing light grayish brown; markings dark brown suffused with ochreous; basal fascia outer margin poorly defined, oblique to middle; median fascia narrow, margins

(Figs. 1-4)

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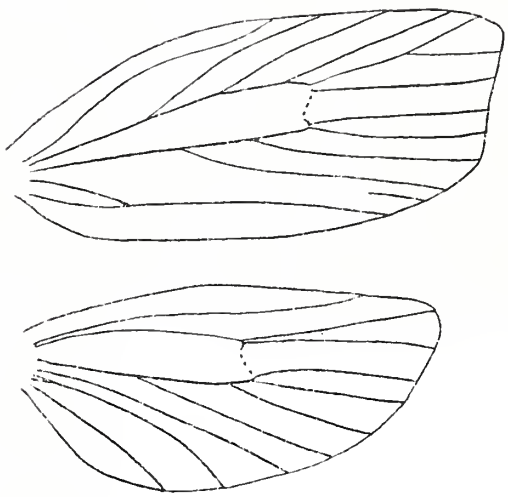

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Adoxophyes orana adults. 1-2. Dorsal view: 1. Male. 2. Female. 3. Head, male, lateral view. 4. Male wing venation, dorsal view (1-2 from Bradley et al. 1973, 3-4 from Obraztsov 1954).

irregular, usually constricted at middle before emitting strong tornal spur; pre-apical spot broken and reduced, emitting strong stria extended to tornal area, second much thinner stria parallel with termen (Bradley et al. 1973). Forewing (Fig. 4) with R4+R5 stalked, less than 9 mm (base to apex), outer margin not excavated before apex, M2+M3 connate or nearly so, distance along cell between M1+M2 about equal to that between Cul+Cu2 (Hannemann 1961). Hindwing gray (Bradley et al. 1973). Male genitalia as in Figs. 5 and 6 (Obraztsov 1954).

Female (Fig. 2). Wingspan 18-22 mm. Antenna minutely ciliate. Forewing without costal fold, ground color grayish brown; markings more subdued than male's, often partially obsolete, occasionally conspicuously reticulate, especially in distal half; venation as under male. Hindwing gray (Bradley et al. 1973). Female genitalia as in Fig. 7 (Obraztsov 1954).

EGGS (Fig. 8) - Yellowish green, flat, waxy, scalelike (Dicker 1977).

LARVAE* (Fig. 9) - Length up to 20 mm. Head pale yellow overlaid with pale brown pattern becoming more evident toward posterior margin; dark pigment in ocellar area; dark pigment at genal juncture extending as bar almost halfway to ocellus 1. Prothoracic shield yellow with a dark patch at posterolateral angles. Thoracic legs yellowish with tarsi slightly darker. Body color pale (dark green in living larvae). Pinaculi and anal shield pale. Spinules slightly darker than body color on dorsum contrasting with pinaculi. Anal fork well developed with 6-8 spines.

Head with ocellus 2 closer to ocellus 3 than to ocellus 1. Prothorax with prespiracular setae almost in line, seta L1 closer to seta L2 than to seta L3. Abdomen with spiracles on segments A1-7 larger than insertion of seta SD1; subventral setal formula on segments 1, 2, 7, 8, and 9 is 3, 3, 3, 2, 2; on segment A9, setae V1 are slightly farther apart than those on segment A8. Anal shield tapered. Abdominal prolegs with about 40 crochets, biordinal, weaker anteriorly.

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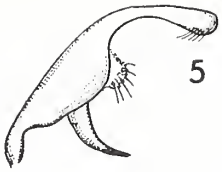
* Prepared by D. M. Weisman, Systematic Entomology Laboratory, Insect Identification and Beneficial Insect Introduction Institute, Agricultural Research Service, USDA, c/o U.S. National Museum of Natural History, Washington, DC 20560

(Figs. 5-9)



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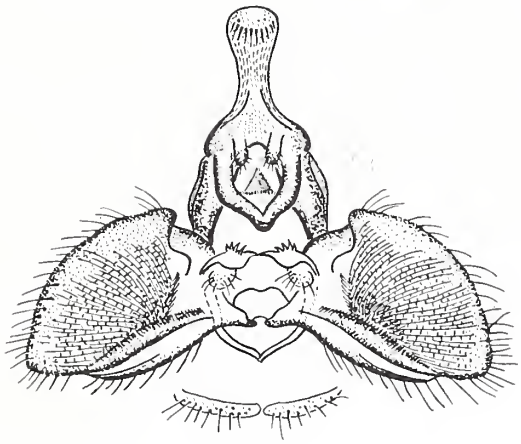

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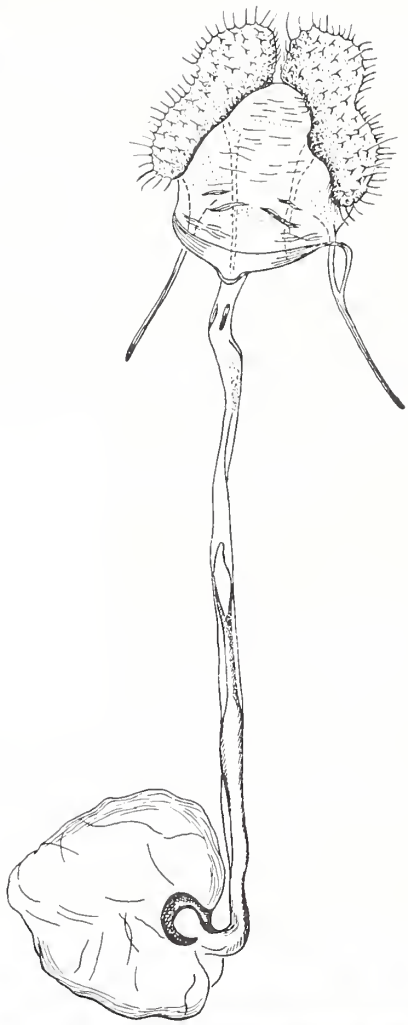

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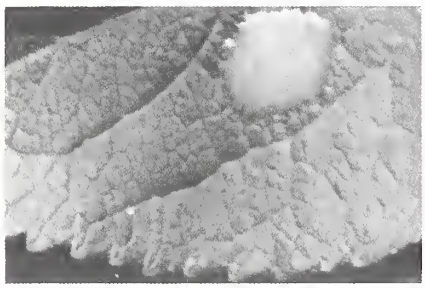

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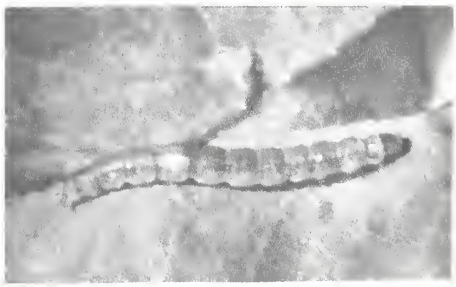

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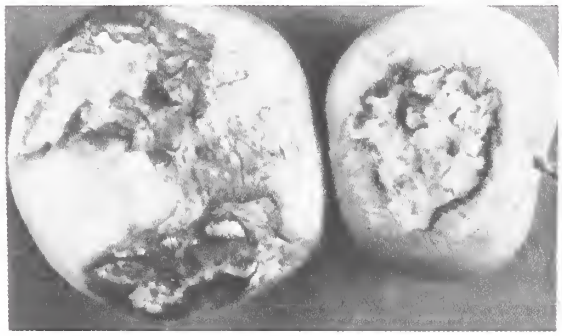
Adoxophyes orana. 5-7. Genitalia: 5. Male, lateral view; 6. Ventral view. 7. Female, ventral view. 8. Eggs on leaf. 9. Larva, dorsolateral view (5-7 from Obraztsov 1954, 8-9 from Balachowsky 1966).

Characteristic Damage

Larval presence can be easily recognized by a large, shallow, irregular area of apple skin removed from the surface (Fig. 10) (Dicker 1977). External damage to fruits often does not go much deeper than the skin. This type of damage primarily decreases the quality of apples and pears. Larvae of the summer generation cause the most severe damage because every small injury will become large by harvest. Larvae of the fall generation feed on the skin. These feeding areas are potential areas for infection by disease organisms, particularly if the fruit is stored for a long time (de Jong and Minks 1981).

(Fig. 10)



Adoxophyes orana larval damage to apples (From Balachowsky 1966).

Detection Notes

A. orana can move as larvae in commercial shipments of fruits. Plant Protection Quarantine (PPQ) inspects these shipments under Title 7, Part 319.56, of the Code of Federal Regulations. If fruits are found infested with A. orana, PPQ requires quarantine actions, such as fumigation. Also, the pupa may be moved on dormant nursery stock. Propagative material of many of the hosts is prohibited, and other hosts, such as Alnus sp. and Betula sp., are inspected on their arrival in the United States under Title 7, Part 319.37.

During 1971 to 1985, PPQ intercepted larvae of this species seven times in the fiscal years 1971-72 at U.S. ports of entry from the Netherlands and the United Kingdom. PPQ commonly intercepts larvae identified only as Tortricidae on various hosts from Europe. Many of them could be this pest.

This species may be detected in the following ways.

1. Watch for adults resting among the leaves during the day in summer and early fall.

2. Look for eggs laid on the upper and lower surfaces of leaves during the summer and fall and sometimes on the fruit in the fall (Bradley et al. 1973).

3. Inspect the fruit for large, shallow, irregular larval feeding areas (Dicker 1977).

4. Inspect the underside of the leaf for white webbing along the midrib.

5. Open spun leaves to search for larvae (Bradley et al. 1973). Larvae wiggle backwards when disturbed (Dicker 1977).

Suspect adult specimens should be pinned and labeled for subsequent identification. Submit suspect larvae or pupae in alcohol for identification.

Biology

In the Netherlands and most other European countries, A. orana develops two generations annually; the flights occur mainly in summer and early fall. The emergence periods may vary according to climatic conditions and sometimes slightly overlap. The adults mate the night following the day of emergence (de Jong et al. 1971). The adults rest among the leaves by day, but fly if the branches are shaken; they fly near dusk and later come to lights (Bradley et al. 1973). Flight occurs above 13° C (U.S. Department of Agriculture 1984).

In the summer and fall, females deposit batches of 4-150 or more eggs, usually on the upper and lower surfaces of leaves and, in the fall, occasionally on the fruit. A female may lay a total of 200-400 eggs (Bradley et al. 1973). Oviposition greatly increases above 15° C, whereas temperatures below 13° C inhibit most activity (de Jong et al. 1971). The eggs hatch in 8-20 days (Bradley et al. 1973).

Overwintered larvae in Romania begin feeding in the spring after an accumulation of about 67 degree-days C based on a 9° C developmental threshold (U.S. Department of Agriculture 1984). Larvae in the Netherlands feed on buds, flowers, and young leaves in April and on fruitlets in May. Because most of the damaged fruitlets will drop in June, a large number of larvae can be tolerated on the trees in spring (de Jong and Beeke 1976).

In the United Kingdom from June through July, the larvae producing the summer generation of adults, spin a white silken web along the midrib on the underside of the leaf (Fig. 11) and gnaw the lower surface without perforating the leaf. In later

instars, larvae disperse and pupate in leaves bound together. Sometimes the larva attaches a leaf to a fruit (Fig. 12) and feeds beneath the leaf on the skin of the fruit (Bradley et al. 1973). These summer generation larvae grow rapidly and cause considerable damage to the fruits, so that only small numbers can be tolerated on the trees (de Jong and Beeke 1976). The summer generation of larvae lasts, on average, 430 degree-days C above a threshold of 7° C in France (U.S. Department of Agriculture 1984).

(Figs. 11-12)

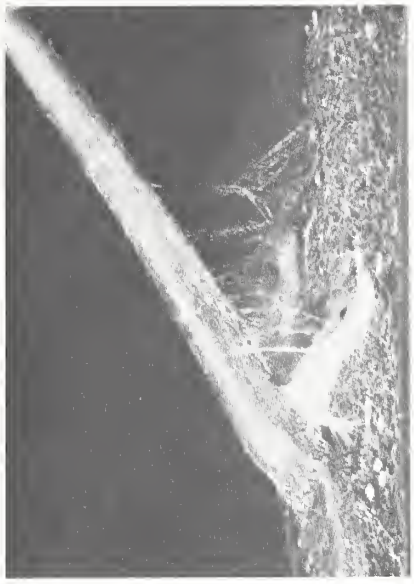
11

12

Adoxophyes orana. 11. Larval webs along the midrib on the underside of the leaf of young plum. 12. Leaf attached to pear by larva (All from Balachowsky 1966).

In the United Kingdom, the second generation larvae hatch in early fall and normally overwinter in the second or third instar (Bradley et al. 1973). Diapause is induced by short (less than 12-hour) day length (U.S. Department of Agriculture 1984). In the fall, they feed on the leaves or on the surface of the ripening fruit before hibernating in a silken hibernaculum spun between a dead leaf and a twig, two shoots on a spur, a mummified apple and a branch, or any similar situation (Fig. 13) (Bradley et al. 1973).

(Fig. 13)



Adoxophyes orana larval web at intersection of branches (From Balachowsky 1966).

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